

**IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE**

Inventors: Dennis W. Tom et al **Examiner:** M. Brooke
Serial No: Unassigned **Group Art Unit:** 2853
Filing Date: HereWith
Title: METHOD OF COUPLING A BARRIER LAYER
TO A SUBSTRATE OF A FLUID EJECTION DEVICE (As Amended)

Assistant Commissioner for Patents
Washington DC 20231

PRELIMINARY AMENDMENT

Dear Sir:

Please amend the application as follows:

In the Title:

METHOD OF COUPLING A BARRIER LAYER TO A SUBSTRATE OF A
FLUID EJECTION DEVICE (As Amended)

In the Specification:

Please replace the entire original specification with the attached substitute
specification.

In the Claims:

1. (Amended) A method for securely anchoring a barrier layer to a substrate
in a fluid ejection device comprising:
 applying a lower layer comprised of a first metal to a substrate having a fluid
ejector;
 applying an upper layer comprised of a second metal to said lower layer;
 etching said upper layer in order to remove a plurality of portions thereof while
leaving a plurality of other portions of said upper layer intact, said etching of said upper
layer also exposing multiple regions of said lower layer;
 etching said multiple regions of said lower layer that were exposed after said
etching of said upper layer in order to remove said multiple regions and produce a

plurality of structures positioned on said substrate, said structures being spaced apart from each other and each comprising an etched section of said lower layer and a section of said upper layer thereon;

etching at least one of said structures on said substrate in order to remove said section of said upper layer therefrom and thereby produce an anchor member; and

covering said structures, said anchor member, and exposed portions of said substrate therebetween with a layer of at least one fluid barrier material, said anchor member securely attaching said layer of fluid barrier material to said substrate.

7. (Amended) The method of claim 1 further comprising heating said fluid barrier material to a temperature sufficient to cause said fluid barrier material to flow around said anchor member.

8. (Amended) The method of claim 7 wherein said temperature sufficient to cause said fluid barrier material to flow around said anchor member is about 50 - 500 °C.

9. (Amended) A method for securely anchoring a barrier layer to a substrate in a printhead comprising:

forming at least one metallic anchor member on a substrate having a fluid ejector thereon; and

covering said anchor member with a layer of at least one fluid barrier material, said anchor member securely attaching said layer of fluid barrier material to said substrate.

Please cancel claim 12 without prejudice.

13. (Amended) A method for securely anchoring a barrier layer to a substrate in a printhead comprising:

applying at least one layer comprised of metal to a substrate having a fluid ejector;

forming at least one metallic anchor member on said layer; and

covering said anchor member with a layer of at least one fluid barrier material, said anchor member securely attaching said ink barrier material to said substrate.

Please cancel claims 14-19 without prejudice.

Please add the following claims:

20. (new) A method of forming a fluid ejection device comprising:
disposing a mechanical intercoupling structure on a substrate at least one
fluid ejector thereon;

disposing a chamber layer over said substrate, wherein side walls of an
ejection chamber are defined with the chamber layer;

substantially embedding said mechanical intercoupling structure with the
chamber layer; and

encapsulating the mechanical intercoupling structure with the substrate
and the chamber layer.

21. (new) The method of claim 20, wherein said mechanical intercoupling
structure secures said chamber layer to said substrate.

22. (new) The method of claim 20, wherein said mechanical intercoupling
structure is comprised of a metal.

23. (new) The method of claim 22, wherein said mechanical intercoupling
structure includes at least one of the metals tantalum, aluminum, rhodium, chromium,
titanium, molybdenum, tungsten, platinum, and palladium.

24. (new) The method of claim 20, wherein said chamber layer covers a
conductive trace, wherein said chamber layer is a fluid barrier that substantially hinders
interaction of a fluid with said conductive trace.

25. (new) The method of claim 20, wherein said chamber layer comprises an
electrically insulative material.

26. (new) The method of claim 20, wherein said chamber layer comprises a polymer.

27. (new) The method of claim 20, wherein said mechanical intercoupling structure is substantially hour-glass shaped in that the structure has top and bottom surfaces, and a narrowed portion therebetween.

28. (new) The method of claim 20, wherein said mechanical intercoupling structure includes a concave side wall.

29. (new) The method of claim 20, wherein said concave side wall is curved.

30. (new) The method of claim 20, wherein said mechanical intercoupling structure includes: a top surface defining a top surface width; a bottom surface; and a central portion between the top surface and the bottom surface defining a width that is less than the top surface width.

31. (new) A method of coupling a barrier layer to a substrate of a fluid ejection device comprising:

positioning at least one metallic anchor member on a substrate;

positioning a layer of barrier material over the substrate and the at least one metallic anchor member;

substantially embedding said at least one metallic anchor member with the layer of barrier material; and

encapsulating the at least one metallic anchor member with the substrate and the barrier layer.

32. (new) The method of claim 31, wherein said metallic anchor member secures said layer of barrier material to said substrate.

33. (new) The method of claim 31, wherein said metallic anchor member further includes:

a first metal layer disposed on a portion of said substrate; and

a second metal layer disposed on at least a portion of said first metal layer, and wherein said second metal layer is different from said first metal layer.

34. (new) The method of claim 33, wherein said metallic anchor member is substantially hour-glass shaped in that the structure has top and bottom surfaces, and a narrowed portion therebetween.

35. (new) The method of claim 31, wherein said metallic anchor member includes a concave side wall.

36. (new) The method of claim 35, wherein said concave side wall is curved.

37. (new) The method of claim 31, wherein said metallic anchor member includes:

a top surface defining a top surface width;

a bottom surface; and

a central portion between the top surface and the bottom surface defining a width that is less than the top surface width.

38. (new) A method of forming a fluid ejection cartridge comprising:

fluidically coupled a fluid reservoir with a fluid ejection device, wherein the fluid ejection device has a substrate having at least one fluid ejector thereon, a mechanical intercoupling structure disposed on said substrate, and a firing chamber layer disposed on said substrate and defining side walls of a firing chamber; and

substantially embedding said mechanical intercoupling structure into the firing chamber layer; and

encapsulating the mechanical intercoupling structure with the substrate and the firing chamber layer.

39. (new) The method of claim 38, wherein said mechanical intercoupling structure secures said firing chamber layer to said substrate.

40. (new) The method of claim 38, wherein said mechanical intercoupling structure is comprised of a metal.

41. (new) The method of claim 38, wherein said mechanical intercoupling structure includes: a first metal layer disposed on a portion of said substrate; and a second metal layer disposed on at least a portion of said first metal layer, and wherein said second metal layer is different from said first metal layer.

42. (new) The method of claim 38, wherein said mechanical intercoupling structure is substantially hour-glass shaped in that the structure has top and bottom surfaces, and a narrowed portion therebetween.

43. (new) The method of claim 42, wherein said mechanical intercoupling structure includes a concave side wall.

44. (new) The method of claim 43, wherein said concave side wall is curved.

45. (new) A method of coupling a barrier layer to a substrate of a fluid ejection device comprising:

forming a fluid ejector on a first area of said substrate;

disposing the barrier layer over a second area that surrounds the first area, wherein the barrier layer surrounds said fluid ejector;

a substrate having a first area surrounded by said second area;

coupling said barrier layer to said substrate in the second area with an anchor means; and

encapsulating the anchor means with the substrate and the barrier layer.

46. (new) The method of claim 45, wherein said anchor means includes an anchor member extending from said substrate and encompassed by said barrier layer, wherein said anchor member has a concave and curved side wall.

Remarks

Claims 1-11, 13, and 20-46 are pending in this application. Claims 12, and 14-19 have been cancelled without prejudice. Claims 20-46 have been added. Claims 1, 7, 8, 9, and 13 have been amended for clarity.

Submitted herewith are a substitute specification and a marked up version showing all of the changes. The substitute specification, which has been amended for clarity, contains no new matter.

Applicant respectfully requests that the added and amended claims be entered in this case before substantive examination thereof.

Respectfully submitted,

Dennis W. Tom, et al.

Legal Dept.
Hewlett-Packard Company
1000 NE Circle Blvd.
Corvallis, OR 97330
Tele: (541) 715-7036
Fax: (541) 715-8581

By: 
Lucinda G. Auciello, Reg. No: 42,270
Attorney For Applicants

Encl: Marked up claims

Substitute specification and compare copy

Marked-up claims

1. (Amended) A method for securely anchoring [an ink] a barrier layer to a substrate in a [printhead] fluid ejection device comprising:

[providing a substrate comprising at least one ink ejector thereon;]

applying a lower layer comprised of a first metal to [said] a substrate having a fluid ejector;

applying an upper layer comprised of a second metal to said lower layer;

etching said upper layer in order to remove a plurality of portions thereof while leaving a plurality of other portions of said upper layer intact, said etching of said upper layer also exposing multiple regions of said lower layer;

[isotropically] etching said multiple regions of said lower layer that were exposed after said etching of said upper layer in order to remove said multiple regions and produce a plurality of [upwardly-extending] structures positioned on said substrate, said [upwardly-extending] structures being spaced apart from each other and each comprising an [isotropically-etched] etched section of said lower layer and a section of said upper layer thereon;

etching at least one of said [upwardly-extending] structures on said substrate in order to remove said section of said upper layer therefrom and thereby produce an [isotropically-etched] anchor member; and

covering said [upwardly-extending] structures, said anchor member, and [any] exposed portions of said substrate therebetween with a layer of at least one [ink] fluid barrier material, said anchor member securely attaching said layer of [ink] fluid barrier material to said substrate.

7. (Amended) The method of claim 1 further comprising heating said [ink] fluid barrier material to a temperature sufficient to cause said [ink] fluid barrier material to flow around said anchor member.

8. The method of claim 7 wherein said temperature sufficient to cause said [ink] fluid barrier material to flow around said anchor member is about 50 - 500 °C.

9. A method for securely anchoring [an ink] a barrier layer to a substrate in a printhead comprising: [providing a substrate comprising at least one ink ejector thereon;]

forming at least one [isotropically-etched upwardly-extending] metallic anchor member on [said] a substrate having a fluid ejector thereon; and

covering said anchor member with a layer of at least one [ink] fluid barrier material, said anchor member securely attaching said layer of [ink] fluid barrier material to said substrate.

13. A method for securely anchoring [an ink] a barrier layer to a substrate in a printhead comprising: [providing a substrate comprising at least one ink ejector thereon;]

applying at least one layer comprised of metal to [said] a substrate having a fluid ejector;

forming at least one [isotropically-etched upwardly-extending] metallic anchor member on said layer; and

covering said anchor member with a layer of at least one [ink] fluid barrier material, said anchor member securely attaching said ink barrier material to said substrate.